Broad Field 5
Natural and Physical Sciences

Natural and Physical Sciences is the systematic study of the nature and properties of the universe, and the study of the measurement of and relations between quantity. It employs the principles of the scientific method.

The theoretical content of Broad Field 5 Natural and Physical Sciences includes:

- biological processes
- chemical reactions
- subatomic particles and quantum mechanics
- thermodynamics and entropy
- mathematical and statistical techniques
- observation and measurement
- foundations of artificial intelligence
- scientific method
- laboratory methodology

The main purpose of this broad field of study is to develop an understanding of the workings of the universe, and to extend the body of scientific knowledge.

Fields of study in this broad field are classified into the following narrow fields:

51	Life Science
52	Physical Science
53	Mathematics and Statistics
54	Computer Science
59	Other Natural and Physical Sciences

Exclusions:

Engineering is excluded from this broad field as it is more concerned with technological applications of scientific principles than scientific study itself. It is sufficiently specialised to form a distinct and separate broad field, Broad Field 6 Engineering.

Health is excluded from this broad field as it is more concerned with the application of scientific principles for the care and treatment of patients than scientific study itself. It is sufficiently specialised to form a distinct and separate broad field, Broad Field 2 Health.

Geography is excluded from this broad field as it is concerned with the social impact of the physical environment on human society. It is included in Detailed Field 491 Geography.

Narrow Field 51

Life Science

Life Science is the study of all living organisms, including their interaction with the environment.

The focus of qualifications in Life Science is the structure, function, development, life processes and classification of organisms, and ecology.

Courses of study in Life Sciences aim to develop:

- an understanding of the genetics and physiology of living organisms
- an understanding of the relationship of living organisms to one another as well as the physical environment
- an understanding of the life processes, and the functioning of terrestrial and aquatic ecosystems
- an understanding of how physical, economic, social and technological factors effect the environment
- an understanding of the principles and techniques of scientific research and their application in a laboratory or in the field
- the ability to assess and validate biological data to reach conclusions and determine further areas of investigation

Fields of study in this narrow field are classified into the following detailed fields:

511 Biological Science
512 Environmental Science

511 Biological Science

Biological Science is the study of the structure, function, reproduction, growth, evolution and behaviour of living organisms.

Subjects studied include:

Animal Structure and Function
Biochemistry
Biological Systems
Biology
Cell Biology
Genetics
Metabolism
Molecular and Cellular Biology
Parasitology
Zoology

Skills learnt include:

- examining cells and tissue to determine their structure and function
- preparing specimens for examination using a variety of techniques
- applying appropriate laboratory and field study techniques and procedures to research
- analysing and interpreting biological data resulting from experiments to test theories and hypotheses
- analysing the factors effecting the growth and reproduction of living organisms

Examples of qualifications include:

1 511 Master of Science in Molecular Biology
Master of Science in Genetics
Master of Science in Parasitology
2 511 Graduate Diploma in Neurosciences
Graduate Diploma in Clinical Biochemistry
Graduate Diploma in Physiology
3 511 Bachelor of Science in Cell Physiology
Bachelor of Science in Botany
Bachelor of Arts in Zoology
5 511 Associate Diploma of Applied Science in Microbiology
Associate Diploma of Applied Science in Biology
Associate Diploma in Biological Techniques

Exclusions:

Forestry is excluded from this narrow field as it is more concerned with the production of timber and timber products for commercial purposes than biology itself. It is included in Detailed Field 892 Forestry.

512 Environmental Science

Environmental Science is the study of the relationships between living organisms and the natural, rural, industrial and urban environments. It includes the study of the impact humans have upon other organisms and on the natural environment.

Subjects studied include:

Climatology
Ecosystems
Energy and Nutrient Cycles
Environmental Values
Hydrology
Microclimatology
Resource Management
Soil Science
Statistics
Toxicology and Pollution

Skills learnt include:

- assessing the impact of humans on the environment
- preparing environmental impact statements
- recognising, evaluating and analysing environmental issues of current and future significance
- applying the principles and practices of managing natural ecosystems

Examples of qualifications include:

1 512 Master of Applied Science in Environmental Studies
Master of Applied Science in Environmental Toxicology
2 512 Graduate Diploma of Science in Tropical Ecology
Graduate Diploma in Environmental Management
Graduate Diploma in Natural Resources
3 512 Bachelor of Environmental Science
Bachelor of Arts in Ecology
Bachelor of Applied Science in Coastal Management
5 512 Associate Diploma of Applied Science in Environmental Technology
Associate Diploma in Land Management
Associate Diploma of Applied Science in Wilderness Reserves and Wildlife
7 512 Certificate in Conservation and Land Management
Certificate of National Park Management
Certificate in Park Ranger Studies

Narrow Field 52

Physical Science

Physical Science is the study of matter and energy, and the transformation patterns linking them. It includes the study of the structure of the earth.

The focus of qualifications in Physical Science is on states and forms of matter and energy, and their relationships to chemical, mechanical and structural systems.

Courses of study in Physical Science aim to develop:

- an understanding of the fundamental properties of the universe and the laws which govern their behaviour
- an understanding of the fundamental properties of elements, compounds and materials, and their reactions and transformations
- an understanding of the physical properties of the earth's crust and the characteristics of its soil, landforms, hydrosphere and atmosphere
- an understanding of the principles and techniques of scientific research and their application in a laboratory or in the field
- the ability to assess and validate physical phenomena to reach conclusions and determine further areas of investigation, and to present these in written and oral form

Fields of study in this narrow field are classified into the following detailed fields:

521 Physics
522 Chemistry
523 Earth Science
529 Physical Science, nec

521 Physics

Physics is the study of the laws governing the states and properties of matter and energy.

Subjects studied include:

Acoustics
Astronomy
Electromagnetic Theory
Electronics
Gravitation
Mathematics
Mechanics
Nuclear and Particle Physics
Optics
Quantum Mechanics
Thermodynamics
Wave Theory

Skills learnt include:

- applying knowledge of physical laws to practical problems
- analysing and interpreting data resulting from experiments to test theories and hypotheses
- applying appropriate laboratory techniques and procedures to research

Examples of qualifications include:

1 521 Master of Science in Physics
Doctor of Philosophy in Astronomy
2 521 Graduate Diploma of Science in Applied Physics
3 521 Bachelor of Science in Physics
Bachelor of Arts in Astronomy
Bachelor of Science in Theoretical Physics
5 521 Associate Diploma of Applied Science in Applied Physics

522 Chemistry

Chemistry is the study of the composition, structure, and the chemical transformations of matter.

Subjects studied include:

Atomic and Molecular Structure
Energy in Chemical Reactions
Equilibrium and Rate Progress
Inorganic and Organic Chemistry
Kinetics and Catalysis
Molecular Properties
Organic Structure Determination
Organic Synthesis
Quantum Mechanics
Spectroscopy and Structure
Stoichiometry

Skills learnt include:

- applying knowledge of the fundamental properties of elements, compounds and their reactions to research and practical situations
- developing and conducting experiments in order to identify the compositional and energy changes resulting from chemical reactions
- using modern chemical instrumentation for the structural analysis of chemical
- testing techniques and processes under a variety of conditions to ascertain the reliability of data

Examples of qualifications include:

1 522 Master of Applied Science in Toxicology
Master of Science in Chemistry
2 522 Graduate Diploma of Science in Analytical Chemistry
Graduate Diploma in Applied Chemistry
3 522 Bachelor of Science in Chemistry
Bachelor of Applied Science in Organic Chemistry
4 522 Diploma of Applied Science in Applied Chemistry
5 522 Associate Diploma of Applied Chemistry
Associate Diploma of Applied Science in Chemical Technology

523 Earth Science

Earth Science is the study of the nature, composition and structure of the earth including its atmosphere and hydrosphere.

Subjects studied include:

Continental Drift and Plate Tectonics
Geochemistry
Geology
Geological Field Techniques
Geophysics
Meteorology
Mineralogy
Oceanography
Palaeontology
Petrology
Sedimentology
Soils Geography

Skills learnt include:

- analysing the structure, composition and evolution of the earth, including its atmosphere and hydrosphere
- identifying and classifying crystals, rocks, minerals and fossils
- analysing, interpreting and preparing geological maps and cross-sections
- using geological instruments and field techniques for geological

Examples of qualifications include:

1 523 Master of Science in Meteorology
Master of Science in Geophysics
2 523 Graduate Diploma in Geoscience
Graduate Diploma in Physical Oceanography
Graduate Diploma of Applied Science in Soil Science
3 523 Bachelor of Applied Science in Geology
Bachelor of Arts in Earth Science
Bachelor of Science in Hydrology
5 523 Associate Diploma in Geoscience
Associate Diploma of Applied Science in Geology
7 523 Certificate of Applied Science in Meteorology
Certificate in Gemmology

529 Physical Science, nec

Physical Science, nec is the study of all Physical Science not elsewhere classified in Narrow Field 52 Physical Science.

Narrow Field 53

Mathematics and Statistics

Mathematics and Statistics is the study of abstract deductive systems, numerical facts, data and their applications.

The focus of Mathematics and Statistics is symbolic language and logic, mathematical and statistical methods, techniques and modelling, and random processes.

Courses of study in Mathematics and Statistics aim to develop:

- an understanding of order and relation in counting, measurement, shapes of objects, logical reasoning and quantitative calculation
- an understanding of the use of deductive reasoning to prove propositions
- an understanding of mathematical theories and their deductive systems
- an understanding of the theory of probability and statistical methods
- the ability to produce reasoned argument based on clearly stated assumptions to obtain complete, consistent and usable results
- the ability to apply mathematical methods and modelling techniques to practical problems

Fields of study in this narrow field are classified into the following detailed fields:

531 Mathematics
532 Statistics

531 Mathematics

Mathematics is the study of deductive systems. It includes algebra, arithmetic, geometry, real and complex analysis and applied mathematics.

Subjects studied include:

Algebra
Calculus
Classical Analysis
Classical Mechanics
Complex Calculus
Differential Equations
Discrete Mathematics
Mathematical Modelling
Numerical Analysis
Optimisation
Principles of Analysis
Probability
Set Theory
Topology
Trigonometry

Skills learnt include:

- analysing and developing mathematical systems and theories
- using systematic methods to prove theorems and to construct, analyse and interpret mathematical models
- applying mathematical methods to problem solving

Examples of qualifications include:

1 531 Doctor of Philosophy in Linear Algebra
Master of Applied Science in Mathematical Modelling
2 531 Graduate Diploma Mathematical Science
Graduate Diploma of Science in Mathematics
Graduate Diploma of Science in Operations Research
3 531 Bachelor of Arts in Mathematics
Bachelor of Science in Applied Mathematics
5 531 Associate Diploma of Applied Science in Mathematics

532 Statistics

Statistics is the study of collecting, describing, arranging and analysing numerical data.

Subject studied include:

Distribution Theory and Inference
Linear Models
Multivariate Models
Numerical Analysis
Probability
Random Variables
Regression
Stochastic Processes
Time Series Analysis

Skills learnt include:

- using statistical models and stochastic processes in the analysis of data
- interpreting descriptive and inferential statistics
- using computer-based statistical packages to analyse data
- applying survey sampling and sampling distribution techniques in survey design and research

Examples of qualifications include:

1 532 Master of Statistics
Doctor of Philosophy in Statistics
2 532 Graduate Diploma of Science in Applied Statistics
Graduate Diploma in Data Analysis
3 532 Bachelor of Science in Statistics
Bachelor of Arts in Data Analysis
Bachelor of Commerce in Actuarial Studies

Narrow Field 54

Computer Science

Computer Science is the study of the design, development and operation of computer systems and computing environments. It includes the study of the design, maintenance and integration of software applications.

The focus of qualifications in Computer Science is computer systems, computer languages, and processing and storage of data.

Courses of study in Computer Science aim to develop:

- an understanding of the design, structure and operation of computer systems
- an understanding of the foundation of computational theory
- an understanding of computer programming techniques
- the ability to analyse, design and manage information systems, provide program specifications, and working programs for their implementation

Fields of study in this narrow field are classified into the following detailed fields:

541 Computer Science

541 Computer Science

Computer Science is the study of the design, development and operation of computer systems and computing environments. It includes the study of the design, maintenance and integration of software applications.

Subjects studied include:

Algorithms
Artificial Intelligence
Computer Architecture
Computers and Society
Database Systems
Graphics
Information Processing
Numerical Analysis
Operating Systems
Programming Languages
Software Engineering
Systems Analysis and Design
Theory of Compilation

Skills learnt include:

- designing systems and methods for processing information
- writing program specifications for implementing information systems
- researching, analysing and solving general problems which require the application of computer technology
- applying computer technology to information processing

Examples of qualifications include:

1 541 Master of Applied Science in Computer Science
Master of Information Technology
2 541 Graduate Diploma in Computing
Graduate Diploma of Applied Science in Computer Applications
Graduate Diploma of Business Technology in Digital Communications
3 541 Bachelor of Business in Data Processing
Bachelor of Applied Science in Computing
Bachelor of Information Technology
Bachelor of Informatics
4 541 Diploma of Computing Science
5 541 Associate Diploma of Applied Science in Computing
Associate Diploma of Business in Computer Programming
Associate Diploma of Engineering in Digital Electronics and Computing
7 541 Certificate of Computer Studies
Certificate in Microcomputing
Certificate in Programming

Narrow Field 59

Other Natural and Physical Sciences

Other Natural and Physical Sciences is the study of all Natural and Physical Sciences not included elsewhere in Broad Field 5 Natural and Physical Sciences.

Fields of study in this narrow field are classified into the following detailed fields:

591 Food Science
592 Laboratory Technology
599 Other Natural and Physical Sciences, nec

591 Food Science

Food Science is the study of the physical and chemical nature of foods, quality control in the processing and handling of food, and the equipment and procedures used in the production and distribution of food.

Subjects studied include:

Biology
Chemistry
Food Analysis
Food Management
Heat Treatment
Hygiene
Microbiology
Nutrition
Preservation
Quality Control

Skills learnt include:

- applying quality control procedures to food processing and handling
- applying principles of food preservation and hygiene to processing operations
- performing physical, chemical, microbiological and organoleptic analysis and evaluation of food
- analysing the nutritional changes in the life-span of food

Examples of qualifications include:

1 591 Master of Science in Food Technology
Master of Applied Science in Food Engineering
2 591 Graduate Diploma in Food Science
Graduate Diploma in Dairy Technology
3 591 Bachelor of Applied Science in Food Science and Technology
Bachelor of Applied Science in Wine Science
Bachelor of Applied Science in Oenology
5 591 Associate Diploma of Applied Science in Food Technology
Associate Diploma in Food Technology
Associate Diploma in Dairy Technology
7 591 Certificate of Meat Inspection
Certificate of Food Processing
Certificate in Cane Testing

592 Laboratory Technology

Laboratory Technology is the study of laboratory techniques and equipment used in biological, chemical, medical and other laboratories.

Subjects studied include:

Anatomy and Physiology
Biochemistry
Biology
Chemistry
Cytology
Genetics
Geology
Haematology
Histology
Laboratory Procedures
Mathematics
Microbiology
Physics
Statistics
Technical Communications

Skills learnt include:

- preparing, analysing and classifying laboratory specimens
- applying the principles of laboratory safety and ethics
- maintaining an efficient and effective system for recording results

- using and maintaining laboratory equipment
- researching, developing and evaluating new laboratory and field techniques

Examples of qualifications include:

1 592 Master Applied Science in Medical Laboratory Science
2 592 Graduate Diploma in Medical Technology
3 592 Bachelor of Applied Science in Medical Laboratory Science
5 592 Associate Diploma of Applied Science in Laboratory Techniques
Associate Diploma of Applied Science in Pathology
6 592 Certificate in Medical Laboratory Science
7 592 Certificate in Laboratory Practices
Certificate of Applied Science in Science Laboratory
Certificate in Laboratory Assisting

599 Other Natural and Physical Sciences, nec

Other Natural and Physical Sciences, nec is the study of all Other Natural and Physical Sciences not elsewhere classified in Narrow Field 59 Other Natural and Physical Sciences.

Examples of qualifications include:

1 599 Master of Applied Science in Conservation of Cultural Materials
3 599 Bachelor of Applied Science in Cultural Materials Conservation